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SECTION OF GEOLOGY AND MINERALOGY

NOVEMBER 5, 1945

DOCTOR MORLEY E. WILSON, Geological Survey of Canada, Ottawa, Ontario, Canada: *The Regional Structural Relations of the Ore Deposits of the Noranda District, Western Quebec.* (This lecture was illustrated by lantern slides.)

Up to a few years ago, most geological maps of Archaean areas in the southern part of the Canadian Pre-Cambrian Shield showed the distribution of formations, but gave little information regarding their structure. In recent years, it has been discovered, however, that Archaean rocks are characterised by features from which their structural succession can be determined. These are mainly pillow and brecciated flow tops in lavas and change of grain and cross-bedding in sediments.

One of the regions in the Shield that has been studied most intensively, during the last 15 years, lies along the fault zone that extends from Kirkland Lake in Ontario eastward for 130 miles to Louvicourt Township in Western Quebec. Most of the zone has been remapped on scales ranging from 500 to 1,600 feet to 1 inch, and it has been ascertained—

(1) That the superficial Archaean rocks of the Noranda-Rouyn

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area in Western Quebec belong areally to three divisions: the Timiskaming Series, the Abitibi (Keewatin) Series, and the Pontiac Group. The Timiskaming Series rests unconformably on both the Abitibi Series and the Pontiac Group, but because of their separate distribution, the relationships of the Abitibi Series to the Pontiac Group is not known. The Pontiac either belongs to a third separate Series, or is a part of the Abitibi Series;

(2) That the zones of carbonate-talc-chlorite alteration with which many of the ore deposits of the Kirkland Lake-Louvicourt fault zone are associated lie along overthrust faults, which developed as an accompaniment of the Pre-Cambrian mountain folding in the region;

(3) That the structure of the Kirkland Lake-Louvicourt fault zone in Western Quebec centers around the Cadillac-Bouzan Lake fault, and, in Ontario, around the Larder Lake "Break." These are in alignment with one another and underlie a deep depression beneath the late Pre-Cambrian Cobalt Series, which forms extensive hills and ridges near the inter-Provincial boundary between Ontario and Quebec. Obviously, they belong to the same fault zone and may be parts of a single fault;

(4) That the fault zones usually contain disseminated pyrite or arsenopyrite and gold in places, but ore deposits of workable extent and grade occur only where a change in strike, a change in wall rock, increased local deformation, or other structural features have permitted more extensive and concentrated deposition from ore-bearing solutions.

We are at the beginning of a new era in Canadian Pre-Cambrian geology, for geological maps, now, not only show the distribution of formations, but their structure as well, and thus direct attention to localities where ore deposits may be present, and development work by diamond drilling or in other ways, may be undertaken. They thus assist more directly than formerly in mineral discovery.

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SECTION OF BIOLOGY

NOVEMBER 12, 1945

DOCTOR GEORGE GAYLORD SIMPSON, Chairman, Department of Geology and Paleontology, The American Museum of Natural History; and Professor of Vertebrate Paleontology, Columbia University: *Tempo and Mode in Evolution.* (This lecture was illustrated by lantern slides.)

INTRODUCTION

The title assigned to me for this paper will be taken as symbolic rather than descriptive. "Tempo and Mode in Evolution"[1] is the name of a book by me, completed in 1942, and published last year. This book attempts to take some of the data available to paleontologists and not to geneticists, and to relate these to recent developments in general evolutionary theory. These data have mainly to do with rates of evolution, including such phenomena as inertia and momentum; and with patterns of evolution, including the modes of radical transformation or of differentiation of populations over long periods of time. It is not proposed here to repeat what has already been discussed at length in this published work. What merit the book may have probably arises for the most part from its attempt to synthesize results obtained in two widely distinct fields of investigation—paleontology and genetics. The aims of this paper will be to give some of the historical background of modern evolutionary theories, to follow the divergence of paleontological and genetical thought on this subject, and to say something about the recent movement by which they are again converging on common problems, with great hope for fruitful future cooperation.

THE EVOLUTION OF EVOLUTION

The major thesis of pure Darwinism, the Darwinism of Darwin, was that individuals vary and transmit their variations to their offspring, that some individuals produce more and some less than their proportionate share of young, that those leaving relatively few or no offspring are, on an average, different from those that do produce the

bulk of the next generation, and that the new generation, therefore, includes fewer of some variants and more of others than did the parental group. This differential, continuing over many generations, involves steady structural change in the group as a whole, and this change is evolution. "Natural selection," the usual label of Darwinian explanations of evolution, is a subsidiary theory seeking to explain why some individuals contributed more than others to the heredity of following generations. Darwin did not know how variations arise, how they are inherited, or which variations are heritable and which are not. If it be granted that heritable variations do exist and that new variants do occasionally appear, facts empirically established then, and now confirmed, this ignorance regarding heredity did not at all invalidate Darwin's theory, but it made it quite incomplete and open to question, in application to particular evolutionary sequences.

Darwin's Darwinism was eclectic and it did not exclude the hypothesis, generally labeled as Lamarckian, although it was broadened beyond the scope originally given it by Lamarck, that heritable variations arise by the interaction of an individual and its environment. Variations arising in this way could supply materials for natural selection, but if hereditary variations do arise in this way, it would be possible for a population to evolve without the action of selection. The later 19th century naturalists tended to develop the ideas of selection and of modification by individual interaction with the environment as two antithetical schools, restricting Darwinism to the first, and calling the second Lamarckism. The separation became complete when Weismann promulgated his germ theory (1892).[2] He correctly identified the physical basis of heredity and, on logical rather than experimental or observational grounds, he concluded that somatic modifications could not affect heredity.

Weismann's neo-Darwinism was more Darwinistic than Darwin. It excluded any Lamarckian (or neo-Lamarckian) factor and made natural selection not merely the essence of the theory but the whole theory. Darwin, himself, did not envisage natural selection as a complete and sufficient cause of evolution and, even by 1892, many difficulties had been found in accepting so simple an explanation. Weismann's extremism made the situation still less satisfactory. While he distinguished more clearly than had Darwin between hereditary and non-hereditary variations, Weismann was largely unsuccessful in dis-

tinguishing adequately which characters were, in fact, hereditary or in providing evidence of the origin of new characters or a mechanism for sustained evolution. The espousal of neo-Darwinism by Weismann's school eventually was a factor in the decline of Darwinism, instead of leading to its general adoption.

The 19th century ended with naturalists and other students of evolution in quite fundamental disagreement. Various forms of modified Darwinism were still dominant, but they were bitterly opposed by some able students and had been subjected to criticisms for which no adequate answer had been found. Progress in the field of general evolutionary theory demanded more knowledge of heredity and, from this time, the students of that subject began to play a leading role. Their influence, at first, was far from unifying. Instead of producing evidence in favor of one or another of the competing types of evolutionary theory, they split the field still farther. De Vries, who published his mutation theory in 1901,[3] showed that distinctive types of plants may arise all at once and at random and he generalized this as the mooted normal course of evolution, a theory consistent neither with Darwinism nor with Lamarckism in any of their diverse forms. As Mendelism was rediscovered and the modern science of genetics developed, de Vries' concepts turned out to be limited and even a little crude, but the evidence of genetics still seemed to many to favor the origin of new forms of life at random, without reference to the environment, and without any subsequent adaptation under the influence of selection.

The *coup de grace* seemed to have been given to Darwinism and neo-Darwinism. A host of alternative theories, old and new, found support in what sometimes was like a battle-royal among the evolutionists. Varied as these theories are, most of them can be classed in four broad schools:

1. *Neo-Lamarckism* continued to have a few adherents. They emphasized the fact (particularly evident to paleontologists) that progressive adaptation does occur, but they agreed with the criticism that natural selection is not an adequate explanation of this phenomenon. Cope, Hertwig, Kammerer, and McDougall exemplify students of different but generally Lamarckian shades of opinion, over a considerable period. Despite their efforts, they failed to provide reasonable neo-Lamarckian explanations of many of the phenomena of evolution. Especially, they failed to controvert the growing genetical evidence

that neo-Lamarckism is impossible, because modifications (as opposed to mutations) cannot be inherited as such, if at all.

2. The many theories that may be classed broadly as vitalistic (in some cases, but misleadingly styled "orthogenetic") assume that evolution follows well-defined lines that are not mechanistically determined but are set by some inner cause or non-material force. Bergson's "*élan vital*," Driesch's "entelechy," Osborn's "aristogenesis," Berg's "nomogenesis," and Broom's evolution directed by spiritual agencies are well-known and, in their various ways, typical. Such theories are essentially non- and sometimes even anti-genetic. They either assume that the directive force operates by producing directional (non-random) mutation, or that mutation is a mere accident having little to do with evolution in the long run. Opponents of these views object to them on the grounds that they are not science but metaphysics or philosophy, and that they are explanations that do not explain, examples of the naming fallacy. As J. S. Huxley has remarked, saying that progressive evolution is caused by an *élan vital* is like "explaining" the motion of a railroad train by an *élan locomotif*.

3. A small and not very popular class of theories is exemplified by Lotsy's evolution by means of hybridization[4] and by Clark's "zoogenesis."[5] Different as these theories are, they have in common that they practically deny the reality of evolution, if we assume that evolution necessarily includes the appearance of new characters from time to time. Lotsy's theory involves little more than the reshuffling of genes and Clark's is essentially based on the sudden segregation of existing genetic characters. Critics of these theories grant that these are unquestionably processes that do occur in evolution, but insist that attempting a general explanation of evolution on such a basis is begging the question. It is necessary to explain how the genes originated in the first place, how they came to be distributed as they were before shuffling and segregation, and what the mechanism of these redistributions is.

4. Finally, there is a group of theories more important than those already listed and stemming from de Vries and the early geneticists. De Vries called his theory "mutation," but this is now misleading, because the word mutation has come to have quite a different meaning. It might be called the saltation or the catastrophic theory, although the leading modern exponent of a theory of this type (Goldschmidt)[6] particularly objects to the latter label. Other geneticists, without nec-

essarily believing that species arise all at once by one big "systemic mutation," have held essentially similar views, maintaining that new variants (or new species) arise spontaneously, at random, and then live, if they can, or die, if they must. These students believe in pre-adaptation but not in adaptation. They believe that selection eliminates the monstrously unfit, but has no further bearing on evolution.

It was theories of this fourth class that were claimed to have put an end both to Darwinism and to Lamarckism. Yet their proponents ignored a vast amount of evidence, accumulated especially by the paleontologists, that seemed quite inexplicable by the current genetic theories. The result, culminating in the early '20's, was hopeless disagreement among paleontologists, geneticists, and systematists (heirs of the old naturalists), the three main groups of students of evolutionary theory. Nor were the students in any one of these groups in agreement among themselves on any fundamental point, except that evolution has somehow managed to occur.

Paleontology and Evolutionary Theory

It seems obvious to us that evolution is the only rational explanation of the paleontological record and that that record is the most direct and unmistakable exemplification of evolution. It seems paradoxical that the paleontologists were not the first to observe this. The fact is that early paleontologists regularly cited the fossil record as evidence *against* the reality of evolution. It was not until Darwin had overwhelmingly established the probability of evolution, with no real help from the paleontologists, that they accepted this as the great unifying principle in their science and began systematically to produce evidence in its favor. Even so, Owen, one of the most eminent of paleontologists, lived for 33 years after the publication of "The Origin of Species," without ever accepting the reality of evolution, still less of Darwin's explanation of it. Meanwhile, however, men like Kowalevsky, in Europe, and Cope and Marsh, in America, had produced conclusive paleontological evidence that evolution is a fact.

This simple but laborious and necessary demonstration was the first and remains one of the greatest contributions of paleontology to evolutionary theory. The function is almost entirely descriptive, and it must be admitted that the tradition of treating paleontology as a descriptive science is still strong. Even now, relatively few paleontolo-

gists are contributing to theory above the descriptive level. This is less true in Europe than in America, where (although it may surprise some to think of practicality in connection with paleontology) paleontology is pursued as much for practical as for truly scientific reasons. It is also less true of vertebrate than of invertebrate paleontology, which has developed more as a geological than as a biological science.

Most of the paleontological theories that will be found in books on evolution or on fossils are really generalized descriptions and not theories in any other sense of the word. For instance, Dollo's so-called law of irreversibility is properly no more than a description of what has been found by observation to be usual in the fossil record. Dollo made no serious attempt to relate this generalization to the evolutionary factors that must be involved. When such an attempt at higher or more truly theoretical study of these phenomena was belatedly made, Dollo's "law" had to be profoundly modified. Similarly, Osborn's adaptive radiation, Gregory's isomerism, and even orthogenesis, as paleontologists have commonly used the word, are really descriptions of what usually or sometimes happened, and not attempts to explain these phenomena in terms of broader evolutionary principles. These descriptive generalizations are extremely important and interesting and have a great contribution to make to the study of evolution and of life, but this contribution cannot well be realized until they are more closely related to the results of genetics and other branches of neobiology. On the other hand, the neobiologists have been deprived of data of crucial importance in their studies, because they have not themselves (with very rare exceptions) understood the bearing of these paleontological generalizations in the broader fields of theory.

Of course, there have always been some paleontologists who were competent and interested students of evolution, in addition to being observers of the course of evolution. Even so, it is rather striking how often they seem to have been working at cross-purposes with the neobiologists—I do not mean to say which group, if either, was at fault. Thus, Cope, who still stands out as the most soundly philosophical paleontologist that America has produced, was a confirmed neo-Lamarckian, and this throughout the period of the first strong enthusiasm for Darwinism and even, at the end of Cope's life, into the period of violently anti-Lamarckian Weismannian neo-Darwinism. Neo-Lamarckism has always had more adherents among paleontologists than among neobiol-

ogists and, to this day, there is a neo-Lamarckian tinge in much paleontological writing. This viewpoint has been so thoroughly undermined by the geneticists that it can barely be called intellectually respectable, at present, and yet the paleontologist, if so inclined, can justly point out that the facts that suggest neo-Lamarckism to him have been ignored by the geneticists.

Growing divergence between paleontologists and neobiologists became acute or apparently complete when the geneticists first came into the ascendency as students of evolution. As has been seen, the main early contribution of the experimental study of heredity to evolutionary theory was mutation in the sense of de Vries. But, in the meantime, paleontologists had produced several descriptive generalizations, apparently inexplicable by de Vriesian mutation or similar later theories of the geneticists, and nevertheless demanding explanation in any acceptable general theory of evolution. One of these generalizations was that evolution is gradual. In the nature of things, this can never be observed in all cases, but even in the '90's it had been found so frequently that most paleontologists believed then, as they do now, that this is usual, if not universal. This is consistent with either Lamarckism or Darwinism. It is not consistent with de Vriesian mutation, at least as a general pattern of evolution, and so it was instrumental in the widespread rejection of that theory and its successors by paleontologists.

Another major generalization involved in the rift between paleontology and genetics was that evolution is often, perhaps usually, sustained and directional. This, too, has been considered inconsistent with de Vriesian or Mendelian mutation, which seems to be essentially random and to provide no mechanism for prolonged, gradual change in a single direction. Some paleontologists considered the phenomenon consistent with Darwinism ("orthoselection") and some did not. On the whole, it seems to have weighed against the complete acceptance of Darwinism, by paleontologists. It is not inconsistent with neo-Lamarckism. Indeed, Plate[7] defined orthogenesis as caused by the direct influence of the environment.

Paleontologists were and are also very insistent that progressive adaptation is typical of evolution without necessarily being universal. Adaptive radiation is one of many paleontological generalizations bearing on this point. Adaptation is one of the leading features of Dar-

winian theory and their observations on this point were instrumental in the fact that so many paleontologists were Darwinists even in the period when Darwinism's demise had been widely announced. Until recently, most geneticists were anti-Darwinian on this point, and this was another reason why paleontologists and geneticists could find no common ground. Like directional evolution, adaptation is consistent with Lamarckism, but, for other reasons, neo-Lamarckism was being abandoned even by paleontologists. Most of them recognized that the geneticists had disproved the inheritance of modifications, even though they could not see that the geneticists had any suitable substitute to offer.

Paleontologists who wished to push their theoretical enquiries beyond the important but relatively superficial level of descriptive generalization were thus in a serious dilemma. None of the three current mechanistic schools, those typified by the names of Lamarck, Darwin, and de Vries, seemed fully adequate to interpret paleontological observations, and the paleontologists themselves failed to find a satisfying alternative. It was in this situation that some paleontologists began to support a non-mechanistic, that is, in a broad sense, a vitalistic explanation. The outstanding example is Osborn's theory of evolution characterized by the (supposed) phenomenon that he called successively definite variation, rectigradation, and aristogenesis. It was almost inevitable that such an escape from the dilemma would be sought by a deeply philosophical paleontologist of his period.

Osborn's theory was not adopted in its entirety or in his terms by any other student. This was, in part, due to the fact that most paleontologists were not sufficiently interested or instructed in biological theory to be aware of the reality and intensity of the dilemma and, in part, it was due to the obscurity and the personal terminology of Osborn's expositions of his views. Nevertheless, his espousal of a form of vitalism (which he did not call by that name) was more important and had more influence than has been generally recognized. Belief in some sort of non-mechanistic factor in evolution, often expressed only vaguely or by implication, became rather widespread among the more thoughtful paleontologists and is by no means negligible at the present time. Yet to most of us, paleontologists, geneticists, and systematists alike, no such theory is acceptable, any more than Bergson's *élan vital* was acceptable as science, and for the same reasons.

The failure of the geneticists to provide explanations really applic-

able to some of the paleontological data and the failure of the paleontologists to find for themselves a really satisfactory way out of their dilemma led to mistrust and even to open antagonism, as between Osborn and Morgan, in one period of their work. The geneticists tended to consider that paleontology was incapable of rising above pure description and they did not even take the trouble to study descriptive paleontology for its bearing on genetics. It was easier to conclude that it had no such bearing. The paleontologists were, as a rule, quite willing to accept this stultifying conclusion, which also spared them the trouble of learning genetics. Many of them felt that genetics was a milk-bottle science, with little or no bearing on evolution in the large, and if this attitude now seems ridiculously provincial to us, it must be admitted that the geneticists did nothing to change it until quite recently.

The position of the systematists was, if anything, still less happy. It was their predecessors who discovered evolution. Darwin's demonstration of the reality of evolution and his particular theory as to how evolution occurs had been based almost entirely on work in fields now included in systematics. The workers of the subsequent three decades who so actively discussed the subject and who seemed for a time about to carry the field for Darwinism were also systematists, for the most part. But it was also the systematists who led the first scientific attacks on Darwinism and who accelerated its decline by helping to reveal its real and great defects. As an example, Robson's work comes immediately to mind. The period of the rise of genetics and decline of Darwinism was also one of decline for systematics. The science became unpopular and the systematists were even despised by many geneticists and other experimental biologists.

Involved in a dilemma even more pressing than that of the paleontologists, many of the surviving systematists simply ignored the new developments and carried on as if they were still in the 19th century, contributing thereby to the scorn heaped on their subject by more progressive students. Others, in the manner of Lotsy and Clark, tried to synthesize genetics with their data but produced only abortive, radically incomplete, or otherwise unsatisfactory solutions. Some, and they are the ones who now seem to have been justified, continued to support modified Darwinism, while broadening and modernizing their methods and lines of study in an attempt to find solutions to the difficulties that

had arisen. Many of them came to agree with Kellogg ("Darwinism Today," 1907)[8] that selection *must* work, even though it was not apparent how it does so.

Synthesis

The history of evolutionary theory, as followed in outline up to this point, is one of disillusion and growing confusion. When a science is advancing along sound lines, it is to be expected that its various avenues of enquiry will tend to converge as regards the more fundamental problems, however diverse may be opinions regarding details. Students of different aspects of evolution in the latter part of the 19th and first quarter of the 20th centuries seemed, on the contrary, to be diverging more and more, perhaps irreconcilably. So extreme and increasing was the conflict, that it was questionable whether all the work done after 1859 had really resulted in any real progress as regards the basic factors of evolution. There is some justification for Shull's suggestion ("Evolution," 1936)[9] that evolutionary theory would now be on a sounder basis if all speculation concerning it had been banned after publication of "The Origin of Species," until the 1920's or '30's.

Yet, in retrospect, it does not really appear that Shull is right on this point or that the efforts made between 1859 and 1920 were wasted. The great accumulation of concrete data has permanent validity and is indispensable. The intelligent gathering of those data required some theoretical aim, even when the data eventually proved that the theories were wrong. The Baconian system of first gathering all possible facts and then proceeding to inductive theorizing has long since been found sterile and is not, in truth, part of the scientific method as it actually works. Nor is it true that all the theories advanced during this period have had to be abandoned, or are likely to be.

It now appears that most of the students of evolution, in its various different aspects, were really converging toward the same fundamental conclusions, but that they were unaware of this because of the barriers between their different avenues of approach. Or, to change the figure of speech, it is as if each student had found a piece of a jigsaw picture, along with a piece or two that was not part of the same picture, and that each was so convinced that he had the essential pieces that they never got together and pooled their pieces to see what the whole picture was really like, to learn what pieces did not fit in, and to determine

what pieces were still missing and must be the objects of further search.

Even in the '20's, a pattern and a consensus were beginning to emerge from the welter of facts and theories that had so long been piling up. One symptom was the swing of the geneticists toward Darwinism, as soon as the fundamentals of individual inheritance were fairly well in hand and the geneticists began to think in terms of gene systems, and, especially, of populations rather than of single genes and isolated lines. For instance, Morgan, dean of geneticists, was an outspoken opponent of Darwinism earlier in his career, but had become definitely neo-Darwinian by 1925 (when he published "Evolution and Genetics").[10] It was not long before geneticists had taken over the defense of Darwinism from the systematists and were assisting in the synthesis of genetics and systematics. A feature of this movement is the mathematical treatment of population genetics, by Fisher,[11] Haldane,[12] Wright,[13] and others. Their work has reinstated natural selection as an effective evolutionary agency. It has finally solved the major problem of how the adaptive results observed by the systematists and paleontologists could be achieved with the hereditary materials and mechanisms observed by the geneticists. An overwhelming mass of genetical data has been marshalled and interpreted in neo-Darwinian terms by Dobzhansky in his great work "Genetics and the Origin of Species" (1937, 1941).[14]

The systematists found their field in favor again. They found, too, that they were no longer at cross-purposes with the geneticists, but were able to work at the same problems with the great force of the combined tools of these two branches of science. "The New Systematics" (1940, edited by J. S. Huxley[15]) illustrated and accelerated this hopeful trend. Mayr's "Systematics and the Origin of Species" (1942)[16] did for the systematists what Dobzhansky's book had done for the geneticists, as the intentional similarity of title suggests. J. S. Huxley provided a balanced treatment from both points of view in "Evolution, the Modern Synthesis" (1942).[17] This epochal book is crowded with examples (in the Darwinian tradition) and it fully, ably, and convincingly presents the neo-Darwinian position as newly reached by geneticists and systematists in unison. It stands as a landmark for a new era of evolutionary theory.

The name "neo-Darwinism" for this recent development is not altogether happy. It is a far cry from Darwinism to this modern theory.

As a matter of fact, it is a still farther cry from the neo-Darwinism of the turn of the century, to what Huxley and others are now calling neo-Darwinism. Yet, the new neo-Darwinism—perhaps, should one say neo-neo-Darwinism—has evolved from Darwin's original and complex theory, and it is not inappropriate that it should perpetuate his name.

Besides adding a wealth of detail, the theory differs essentially from that of Darwin in identifying the truly hereditary units, in accepting the evidence that they are particulate and not continuous, and in recognizing that they do not directly represent or correspond with somatic characters. Strictly Lamarckian factors are rejected. Vitalism in all its guises and disguises is also excluded, not necessarily as being false but as being outside the field of scientific enquiry and not required to explain the facts of evolution, at least on the material level. The Lotsian factor of hybridization and the various other factors involving shuffling and segregation of genes are recognized as parts of the evolutionary process, but not particularly the most essential parts and not, certainly, the whole process. Pre-adaptation is accepted as a fact and as another of the multiple factors of evolution, but, again, it is not considered to be the leading element in evolution. Adaptation, in the Darwinian sense, or post-adaptation, under the influence of natural selection, is held to be an important and widespread phenomenon. Another, more important difference from the original mutation theory, either as proposed by de Vries or in the modern form supported by Goldschmidt, is the belief that small mutations have, on the whole, been more effective than large mutations and, especially, that groups with essentially new genetic systems usually arise gradually under the directive influence of selection and not all at once or at random. Selection is emphasized as an essential, but, of course, not as the only factor in evolution, and it is given a truly creative role. It determines, on the whole and with certain fairly well-defined exceptions, not only what particular mutations will survive, but also what particular combinations of genes or genetic systems and, hence, what somatic types, will be realized.

It would not be expected and it is not the fact that all students of this neo-Darwinian school agree in all respects, nor that all students of evolution now adhere to this school. The degree of agreement and the extent of the consensus are nevertheless quite remarkable. In England and America, only one outstanding and thorough-going dissenter has so

far raised his voice: Goldschmidt.[6] It remains to be seen how rapidly and how generally this movement will spread elsewhere. It reached its full formulation only immediately before and during the war and the reaction of, for instance, the French, German, and Italian students is not yet evident. Non- and anti-Darwinian theories, in great variety, were rather widely held among these students, but it is not unlikely that they will find the new synthesis as useful as have so many English and American (one may add also Russian) students.

So far, this is an impressive and apparently most satisfactory outcome, but, in fact, the synthesis as presented up to this point is not really satisfactory. It is decidedly incomplete and it still has fundamental weakness, because it has not taken adequate notice of the paleontological data and theories. Several of the recent neo-Darwinian works, already referred to, mention paleontology in passing, but they do not derive much from it. Sometimes, the attempt is made to explain away inconvenient paleontological descriptive principles, and sometimes these are mentioned with an admission that they are inexplicable by neo-Darwinism. No theory of evolution can long be satisfactory, even to the geneticists and the systematists, unless it is explicitly shown to be harmonious with the factual record of evolution as revealed by paleontology. Moreover, there are very essential parts of a general theory of evolution that cannot be based on the study of recent animals and plants, alone.

This weakness is revealed, among other indications, by the repetition of the classic Darwinian expression, "the origin of species," in the titles of the books by Dobzhansky and Mayr. They are, of necessity, dealing with the lowest taxonomic levels and with the smallest steps in the evolutionary scale. This is indubitably an excellent point of attack, indeed the only good point when paleontology is left out of the picture, but it does not suffice for a thorough synthesis. There may be some *a priori* likelihood that the factors of evolution involved in large-scale evolution, effecting major morphological changes, and extending over millions of years, will be the same as those involved in speciation, but this can by no means be taken as a firm assumption. It is not even likely that those factors will combine in the same way and produce identical patterns or modes in the larger picture as in the smaller.

Until these points and others related to them have been restudied with the aid of paleontology, the theory cannot be well established. It

is even possible to argue, as Goldschmidt has done so fluently and forcefully, that the neo-Darwinians are amusing themselves with mere minor fluctuations and that all the evolutionary changes that have really mattered have depended on totally different principles.

It is not only that the theory is incomplete until it is supplemented by the inclusion of paleontology in the synthesis, but also that it may be quite wrong, even on its lowest levels, as long as there are apparent inconsistencies between theory and what the fossil record suggests as fact. Both Haldane and Huxley, two of the leading neo-Darwinians, indicate that such inconsistencies may still exist. It is thus not unlikely that their partial synthesis will have to be not only expanded but also altered when it becomes a complete synthesis of evolutionary studies.

The testing of the neo-Darwinian synthesis and, at least, a first step toward its enlargement and modification by the inclusion of paleontology were two of the problems that I set for myself in "Tempo and Mode in Evolution." My proposal for this paper to show how such a study became necessary and what place it has in the development of evolutionary theory has now been carried out. I do not propose to go into any detail as to the results of that study, and those who have read the book know what results were there reached, and also that these results are tentative and quite incomplete. It would, however, be disappointing to conclude this essentially historical study without any mention of the present position or the possible future.

It is my belief that neo-Darwinism is capable of resolving the paleontologists' dilemma to which I have referred. With some modification in detail, partly to be contributed by paleontology, I do not find the neo-Darwinian theory inconsistent with any evolutionary phenomenon as revealed in the fossil record and known to me. It is, to be sure, a long way from mere lack of inconsistency to anything approaching an acceptable scientific explanation. On many points, neo-Darwinism, in its present stage, does provide such an explanation. On others, it does not, but it seems to come as close to this goal as any alternative yet proposed. The further development of this theory seems to me likely to come as close as we are ever going to come to a really general explanation of evolution. It is, of course, inevitable that the theory itself will evolve and it may even change almost completely as more and more is added to the synthesis. The essential and hopeful point is that

paleontologists, geneticists, and systematists have found a common ground at last, that a synthesis is seen as a real possibility, and that all three types of students, and others, are interested in this aim and are actively working toward it together.

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SECTION OF PSYCHOLOGY

NOVEMBER 19, 1945

DOCTOR GORDON W. ALLPORT and DOCTOR LEO J. POSTMAN,* Department of Psychology, Harvard University, Cambridge: *The Basic Psychology of Rumor.* (This lecture was illustrated by lantern slides.)

Although the disadvantages of war far outweigh its advantages, yet we may reckon among its meagre benefits the powerful incentives and exceptional opportunities that war gives to scientists to advance their knowledge in fields which normally they neglect to explore or are wont to explore in a desultory fashion. Social psychology is one of the sciences whose work has been greatly stimulated during the recent conflict. Under the stress of wartime needs, it has made significant progress in several areas of investigation. Among them, we name propaganda analysis, morale studies, public opinion measurement, food habits, group therapy, situational tests for selecting personnel, minority group problems, the nature of prejudice, of re-education, and of rumor.[1] It is the last area of progress that we shall here explore.

RUMORS IN WARTIME

During the year 1942, rumor became a national problem of considerable urgency. Its first dangerous manifestation was felt soon after the initial shock of Pearl Harbor. This traumatic event dislocated our normal channels of communication by bringing into existence an unfamiliar and unwelcome, if at the same time a relatively mild censorship of news, and it simultaneously dislocated the lives of millions of citizens whose futures abruptly became hostages to fortune.

This combination of circumstances created the most fertile of all possible soils for the propagation of rumor. We now know that *rumors concerning a given subject-matter will circulate within a group in pro-*

* This paper was presented by Dr. Allport.

[1] For a review of civilian wartime investigations in these fields, see **G. W. Allport & H. R. Veltfort** Social Psychology and the Civilian War Effort, J. Soc. Psychol. (S.P.S.S.I. Bulletin). **18:** 165–233, 1943; **G. R. Schmeidler & G. W. Allport** Social Psychology and the Civilian War Effort, May 1943–May 1944. J. Soc. Psychol. (S.P.S.S.I. Bulletin) **20:** 145–180. 1944.

portion to the importance and the ambiguity of this subject-matter in the lives of individual members of the group.

The affair of Pearl Harbor was fraught with both importance and ambiguity to nearly every citizen. The affair was important because of the potential danger it represented to all of us, and because its aftermath of mobilization affected every life. It was ambiguous because no one seemed quite certain of the extent of, reasons for, or consequences of the attack. Since the two conditions of rumor—importance and ambiguity—were at a maximum, we had an unprecedented flood of what became known as "Pearl Harbor rumors." It was said that our fleet was "wiped out," that Washington didn't dare to tell the extent of the damage, that Hawaii was in the hands of the Japanese. So widespread and so demoralizing were these tales that, on February 22, 1942, President Roosevelt broadcast a speech devoted entirely to denying the harmful rumors and to reiterating the official report on the losses.

Did the solemn assurance of the Commander-in-Chief restore the confidence of the people and eliminate the tales of suspicion and fear? It so happens that a bit of objective evidence on this question became available to us almost by accident. On the twenty-first of February, the day before the President's speech, we had asked approximately two-hundred college students whether they thought our losses at Pearl Harbor were "greater," "much greater," or "no greater" than the official Knox report had stated. Among these students, 68 per cent had believed the demoralizing rumors in preference to the official report, and insisted that the losses were "greater" or "much greater" than Washington admitted. Then came the President's speech. The next day, an equivalent group of college students were asked the same question. Among those who had not heard or read the speech the proportion of rumor-believers was still about two-thirds. But among those who were acquainted with the President's speech, the number of rumor-believers fell by 24 per cent. It is important to note that, in spite of the utmost efforts of the highest authority to allay anxiety, approximately 44 per cent of the college population studied were too profoundly affected by the event and by the resulting rumors to accept the reassurance.

The year 1942 was characterised by floods of similar fear-inspired tales. Shipping losses were fantastically exaggerated. Knapp records one instance where a collier was sunk through accident near the Cape Cod Canal. So great was the anxiety of the New England public that

this incident became a fantastic tale of an American ship being torpedoed with the loss of thousands of nurses who were aboard her.[2]

Such wild stories, as we have said, are due to the grave importance of the subject for the average citizen and to the ambiguity to him of the objective situation. This ambiguity may result from the failure of communications, or from a total lack of authentic news, a condition that often prevailed in war-torn countries or among isolated bands of troops who had few reliable sources of news. Again, the ambiguity may be due to the receipt of conflicting news stories, no one more credible than another; or it may be due (as in the case of the Pearl Harbor rumors) to the distrust of many people in the candor of the Administration and in the operation of wartime censorship. As the war progressed, a higher degree of confidence in our news services was rapidly achieved, and rumors concurrently subsided.

In addition to the fear-rumors of 1942, which persisted until the tide of victory commenced to turn, there was a still more numerous crop of hostility-rumors whose theme dealt always with the shortcomings, disloyalty, or inefficiency of some special group of co-belligerents. The Army, the Navy, the Administration, our allies, or American minority groups were the most frequent scapegoats in these rumors. We were told that the Army wasted whole sides of beef, that the Russians greased their guns with lend-lease butter, that Negroes were saving ice-picks for a revolt, and that Jews were evading the draft.

These hostility rumors were the most numerous of all. An analysis of 1000 rumors collected from all parts of the country in 1942,[3] revealed that they could be classified fairly readily as:

Hostility (wedge-driving) rumors	=	66 per cent
Fear (bogey) rumors	=	25 per cent
Wish (pipe-dream) rumors	=	2 per cent
Unclassifiable rumors	=	7 per cent
TOTAL		100 per cent

To be sure, the proportion of fear and wish rumors soon altered. As victory approached, especially on the eve of VE and VJ day, the whirlwind of rumors was almost wholly concerned with the cessation of hostilities, reflecting a goal-gradient phenomenon whereby rumor under special conditions hastens the completion of a desired event. But,

[2] R. H. Knapp A Psychology of Rumor. Pub. Op. Quart. 8: 22–37. 1944.
[3] R. H. Knapp op. cit.: 25.

throughout the war and continuing to the present, it is probably true that the majority of all rumors are of a more or less slanderous nature, expressing hostility against this group or that.

The principal reason why rumor circulates can be briefly stated. It circulates because it *serves the twin function of explaining and relieving emotional tensions felt by individuals.*[4]

The Pearl Harbor rumors, for example, helped to *explain* to the teller why he felt such distressing anxiety. Would his jitters not be justified if it were true that our protecting fleet was "wiped out" at Pearl Harbor? Something serious must have happened to account for his anxiety. Families deprived of sons, husbands or fathers, vaguely cast around for someone to blame for their privation. Well, the Jews, who were said to be evading the draft, were "obviously" not doing their share and thus the heavy burden falling on "good citizens" was explained. True, this draft-evasion charge did not last very long, owing, no doubt, to the inescapable evidence of heavy enlistments among Jews and of their heroic conduct in the war. But when shortages were felt, the traditional Jewish scapegoat was again trotted out as a convenient explanation of the privations suffered. Their operation of the black market "explained" our annoying experiences in the futile pursuit of an evening lamb-chop.

To blame others verbally is not only a mode of explanation for one's emotional distress, but is at the same time a mode of *relief.* Everyone knows the reduction of tension that comes after administering a tongue-lashing. It matters little whether the victim of the tongue-lashing is guilty or not. Dressing down *anyone* to his face or behind his back has the strange property of temporarily reducing hatred felt against this person or, what is more remarkable, of reducing hatred felt against any person or thing. If you wish to deflate a taut inner-tube you can unscrew the valve or you can make a puncture. Unscrewing the valve corresponds to directing our hostility toward the Nazis or Japanese, who were the cause of our suffering. Making a puncture corresponds to displacing the hostility upon innocent victims

[4] This brief formula leaves out of account only the relatively few rumors which seem to serve the purpose of "phatic communication,"—a form of idle conversation to facilitate social intercourse. When a lull occurs in a conversation, an individual may "fill in" with the latest bit of gossip that comes to mind, without being motivated by the deeper tensions that underlie the great bulk of rumor-mongering.

In this paper we cannot enter into a fuller discussion of the reasons why people believe some rumors and not others. This question is carefully studied by **F. H. Allport & M. Lepkin** Wartime Rumors of Waste and Special Privilege: Why Some People Believe Them, J. Abnorm. & Soc. Psychol. **40**: 3–36. 1945.

or scapegoats. In either case, the air will escape and relaxation follow. To blame Jews, Negroes, the Administration, brass hats, the OPA, or the politicians, is to bring a certain relief from accumulated feelings of hostility whatever their true cause. Relief, odd as it may seem, comes also from "bogey" rumors. To tell my neighbor that the Cape Cod Canal is choked with corpses is an easy manner of projecting into the outer world my own choking anxieties concerning my son or my friends in combat service. Having shared my anxiety with my friend by telling him exaggerated tales of losses or of atrocities, I no longer feel so much alone and helpless. Through my rumor-spreading, others, too, are put "on the alert." I therefore feel reassured.

That rumors were harmful to national morale was quickly recognized both by federal authorities and by civilian leaders of opinion. The efforts of the FBI to trace subversive rumors constitute a story yet to be told; the preventive campaign conducted by OWI and other federal agencies marks another chapter in the story; the establishment of "Rumor Clinics" in at least 40 newspapers in the United States and Canada is yet another. Lectures, pamphlets, movies, posters, and "rumor-wardens" all formed part of the campaign. This activity was at its peak during 1942–43. As victory became assured, the emotional insistency of anxiety and hate subsided, news services became more widely believed, rumor lessened, and the immediate crisis passed.

Though it was the darker days of the war that focused our attention upon rumor as a grave social problem, still the mischief of rumor and gossip is something we always have with us. At the present time, there is reason to suppose that we may be headed for another critical period of rumor-mongering, since we anticipate sharp clashes between minority groups of Americans and majority groups during the coming years of social readjustment. Records of the bitter race conflicts in Los Angeles, Beaumont, Harlem, Philadelphia, and Detroit have taught us what a close association exists between rumors and riot. The tie is so intimate that one of the best barometers we have of social strain lies in the analysis of rumors circulating in a tense community.[5]

Experimental Approach

Leaving now the broader social setting of the problem, we ask

[5] For an account of the relation of rumors to riots see **A. McC. Lee & N. D. Humphrey** Race Riot. Dryden Press. New York. 1943; and **J. E. Weckler & T. E. Hall** The Police and Minority Groups. Internat. City Managers Association. Chicago. 1944.

ourselves what processes in the human mind account for the spectacular distortions and exaggerations that enter into the rumor-process, and lead to so much damage to the public intelligence and public conscience.

Since it is very difficult to trace in detail the course of a rumor in everyday life, we have endeavored by an experimental technique to study as many of the basic phenomena as possible under relatively well controlled laboratory conditions.

Our method is simple. A slide is thrown upon a screen. Ordinarily, a semi-dramatic picture is used containing a large number of related details. Six or seven subjects, who have not seen the picture, wait in an adjacent room. One of them enters and takes a position where he cannot see the screen. Someone in the audience (or the experimenter) describes the picture, giving about twenty details in the account. A second subject enters the room and stands beside the first

FIGURE 1. A sample of pictorial material employed in the experiments.—When the experiment was conducted at the New York Academy of Sciences, the terminal (sixth) report ran as follows:

> "A subway scene on the IRT, between Van Cortlandt Park and Dyckman Street. Four people are standing, two are seated. There is a colored man and a white man. One of them has a razor." (In the ante-terminal report, it was said that the Negro held the razor.)

subject who proceeds to tell him all he can about the picture. (All subjects are under instruction to report as "accurately as possible what you have heard.") The first subject then takes his seat, and a third enters to hear the story from the second subject. Each succeeding subject hears and repeats the story in the same way. Thus, the audience is able to watch the deterioration of the rumor by comparing the successive versions with the stimulus-picture which remains on the screen throughout the experiment.

This procedure has been used with over forty groups of subjects, including college undergraduates, Army trainees in ASTP, members of community forums, patients in an Army hospital, members of a Teachers' Round Table, and police officials in a training course. In addition to these adult subjects, children in a private school were used, in grades from the fourth through the ninth. In some experiments, Negro subjects took part along with whites, a fact which, as we shall see, had important consequences when the test-pictures depicted scenes with a "racial angle."

All of these experiments took place before an audience (20–300 spectators). By using volunteer subjects, one eliminates the danger of stage fright. There was, however, a social influence in all the audience situations. The magnitude of this influence was studied in a control group of experiments where no one was present in the room excepting the subject and the experimenter.

At the outset, it is necessary to admit that in five respects this experimental situation fails to reproduce accurately the conditions of rumor-spreading in everyday life. (1) The effect of an audience is considerable, tending to create caution and to shorten the report. Without an audience subjects gave on the average twice as many details as with an audience. (2) The effect of the instructions is to maximize accuracy and induce caution. In ordinary rumor-spreading, there is no critical experimenter on hand to see whether the tale is rightly repeated. (3) There is no opportunity for subjects to ask questions of his informer. In ordinary rumor-spreading, the listener can chat with his informer and, if he wishes, cross-examine him. (4) The lapse of time between hearing and telling in the experimental situation is very slight. In ordinary rumor spreading, it is much greater. (5) Most important of all, the conditions of motivation are quite different. In the experiment, the subject is striving for *accuracy*.

His own fears, hates, wishes are not likely to be aroused under the experimental conditions. In short, he is not the spontaneous rumor-agent that he is in ordinary life. His stake in spreading the experimental rumor is neither personal nor deeply motivated.

It should be noted that all of these conditions, excepting the third, may be expected to enhance the accuracy of the report in the experimental situation, and to yield far less distortion and projection than in real-life rumor-spreading.

In spite of the fact that our experiment does not completely reproduce the normal conditions for rumor, still we believe that all essential changes and distortions are represented in our results. "Indoor" rumors may not be as lively, as emotionally-toned, or as extreme as "outdoor" rumors, and yet the same basic phenomena are demonstrable in both.

What happens in both real-life and laboratory rumors is a complex course of distortion in which three inter-related tendencies are clearly distinguishable.

Leveling

As rumor travels, it tends to grow shorter, more concise, more easily grasped and told. In successive versions, fewer words are used and fewer details are mentioned.

The number of details *retained* declines most sharply at the beginning of the series of reproductions. The number continues to decline, more slowly, throughout the experiment. Figure 2 shows the percentage of the details initially given which are retained in each successive reproduction.

The number of items enumerated in the description from the screen constitutes the 100 per cent level, and all subsequent percentages are calculated from that base. The curve, based on 11 experiments, shows that about 70 per cent of the details are eliminated in the course of five or six mouth-to-mouth transmissions, even when virtually no time lapse intervenes.

The curve is like the famous Ebbinghaus curve for decline in individual retention, though in his experiments the interval between initial learning and successive reproductions was not as short as under the conditions of our experiment. Comparing the present curve with Ebbinghaus's, we conclude that *social memory accomplishes as much*

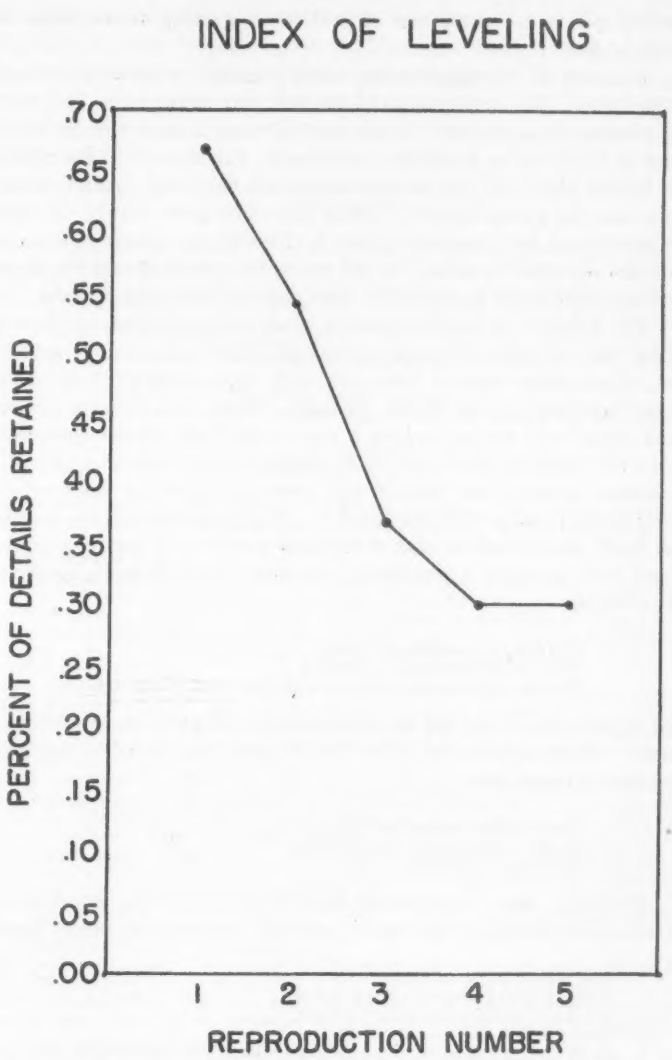

FIGURE 2. Percentage of details originally given which are retained in each successive reproduction.

leveling within a few minutes as individual memory accomplishes in weeks of time.

Leveling (in our experiments) never proceeds to the point of total obliteration. The stabilization of the last part of the curve is a finding of some consequence. It indicates (1) that a short concise statement is likely to be faithfully reproduced; (2) that when the report has become short and concise, the subject has very little detail to select from and the possibilities of further distortion grow fewer; (3) that the assignment becomes so easy that a virtually rote memory serves to hold the material in mind. In all cases, the terminal and the anteterminal reports are more similar than any two preceding reports.

The reliance on rote is probably more conspicuous in our experiments than in ordinary rumor-spreading, where accuracy is not the aim, where time interval interferes with rote retention, and where strong interests prevent literal memory. There are, however, conditions where rote memory plays a part in ordinary rumor-spreading. If the individual is motivated by no stronger desire than to make conversation, he may find himself idly repeating what he has recently heard in the form in which he heard it. If a rumor has become so crisp and brief, so sloganized, that it requires no effort to retain it in the literal form in which it was heard, rote memory seems to be involved. For example:

The Jews are evading the draft
The CIO is communist controlled
Wallace believes in a pint of milk for every Hottentot

The importance of rote has been recognized by the writers of advertisements. They endeavor to make their slogans brief, concise, rhythmic and easy to remember:

Lucky Strikes mean finer tobacco
Smoke Chesterfields—they satisfy
Duz does everything

Similarly, many legends and superstitions have been abbreviated to such an aphoristic point that it is almost impossible to forget them:

Stuff a cold and starve a fever
An apple a day keeps the doctor away
A red sky at night, the sailor's delight
Spare the rod and spoil the child
Early to bed and early to rise makes a man healthy and wealthy and wise

We conclude that whenever verbal material is transmitted among a group of people whether as rumor, legend, or history, change will be in the direction of greater brevity and conciseness. Leveling is not a random phenomenon—we note in the following protocol how a group of soldier subjects tends to retain a military orientation throughout their series of reports.

Protocol A

Description from the screen: The scene is laid in France during wartime. Several men in uniform are obvious. Two of them are firing, one is on his back wounded, with a bandage around his knee. There is a Negro soldier standing, ready to throw a hand-grenade. Behind them there is a destroyed building with one doorway. There is a sign at the crossroads, reading "Cherbourg 21½ km., Paris 50 km." There is also a sign reading "Pain et Vin." There are shells at the sides of the wrecked building. Behind the building there is a church with a big roof hole. The church has a steeple, with the clock showing ten minutes to two. There are two aeroplanes behind the church, as there are explosions to be seen. There is an ambulance at the extreme right, with men coming out with shells. Sign, "Bread and Wine."

First Reproduction: The scene is laid in France. There are two soldiers in a trench, close behind them, is another, wounded. Nearby there is a wrecked house. A Negro soldier is throwing a grenade. There are signs reading "50 miles to Cherbourg and 21 miles to Paris." There is a church with a steeple, showing ten minutes to two. The designation of shells bursting indicates that there is a battle going on. There is an ambulance somewhere in the picture. There is a sign "Bread and Wine."

Second Reproduction: The scene is in France. There is a trench with two men, one firing. A soldier is on his back, wounded. There is a signpost—"Paris 50 miles and Cherbourg 21 miles." There is an ambulance in the picture. There is a house or a barn behind a Negro soldier throwing a grenade. Behind the house is a church. On the steeple the time reads ten minutes to two. Behind the church there are some aeroplanes.

Third Reproduction: The scene is in France. There are two soldiers in a trench and a wounded soldier. There is an ambulance in the picture, and a house in the background, also a church with a steeple; the time is . . . I don't remember. There is a signpost "Cherbourg 21 miles, Paris 50 miles." There is a Negro soldier in the picture.

Fourth Reproduction: The scene takes place in France, 21 miles from Cherbourg, 50 miles from Paris. This information is given by a signpost. There are two soldiers in the picture and also a Negro soldier. In the distance there is a church, and also a house. There is an ambulance nearby.

Fifth Reproduction: The scene is in France, 21 miles from Cherbourg, 50 miles from Paris, as we can read on a signpost. There is a Negro soldier in the picture. There is a church nearby and also an ambulance.

Sixth Reproduction: The scene is in France, 21 miles from Cherbourg, and 50 miles from Paris, as a signpost indicates. There is a Negro soldier in the scene. An ambulance and a church are nearby.

Seventh Reproduction: The scene is in France, 21 miles from Cherbourg, 50 miles from Paris. There is a Negro soldier in the scene, and also an ambulance.

Eighth Reproduction: The scene is in France, 50 miles from Cherbourg and at a distance from Paris, and in this scene is an ambulance and also a Negro soldier.

This protocol shows the continual shortening of the rumor, but,

at the same time, the tendency of military subjects to preserve their orientation in space. The scene is always correctly laid in France, somewhere between Cherbourg and Paris. To be sure, kilometers are transposed into the more familiar measure of "miles," and the figure "50" gets attached to Cherbourg rather than Paris. Like every other rumor the report as received from hearsay is worthless, yet there is a selective type of retention that follows the occupational interest of the subject. Non-military subjects are much less likely to retain measures of distance or of time.

Sharpening

We may define sharpening as the selective perception, retention, and reporting of a limited number of details from a larger context. In the military protocol just cited, geographical features are sharpened. Sharpening is inevitably the reciprocal of leveling. The one cannot exist without the other, for what little remains to a rumor after leveling has taken place is by contrast unavoidably featured.

Although sharpening occurs in every protocol, the same items are not always emphasized. Sometimes, a trifling detail such as subway advertising card becomes the focus of attention and report. Around it the whole rumor becomes structured. But, in most experiments, this same detail drops out promptly, and is never heard of after the first reproduction.

One way in which sharpening seems to be determined is through the retention of odd, or attention-getting words which, having appeared early in the series, catch the attention of each successive listener and are often passed on in preference to other details intrinsically more important to the story. An instance of this effect is seen in a series of protocols where the statement, "there is a boy stealing and a man remonstrating with him" is transmitted throughout the entire series. The unusual word "remonstrate" somehow caught the attention of each successive listener and was passed on without change.

Sharpening may also take a *numerical* turn, as in the experiments where emphasized items become reduplicated in the telling. For example, in reports of a picture containing the figure of a Negro, whose size and unusual appearance invite emphasis, we find that the number of Negroes reported in the picture jumps from one to "four" or "several."

There is also *temporal* sharpening manifested in the tendency to

describe events as occurring in the immediate present. What happens *here* and *now* is of greatest interest and importance to the perceiver. In most instances, to be sure, the story is started in the present tense, but even when the initial description is couched in the past tense, immediate reversal occurs and the scene is contemporized by the listener. Obviously, this effect cannot occur in rumors which deal specifically with some alleged past (or future) event. One cannot contemporize the rumor that "the Queen Mary sailed this morning (or will sail tomorrow) with 10,000 troops aboard." Yet it not infrequently happens that stories gain in sharpening by tying them to present conditions. For example, a statement that Mr. X bought a chicken in the black market last week and paid $1.50 a pound for it may be (and usually is) rendered, "I hear they *are* charging $1.50 a pound on the black market for chicken." People are more interested in today than in last week, and the temptation, therefore, is to adapt (assimilate) the time of occurrence, when possible, to this interest.

Sharpening often takes place when there is a clear implication of *movement*. The flying of airplanes and the bursting of bombs are frequently stressed in the telling. Similarly, the falling flower pot in one picture is often retained and accented. Indeed, the "falling motif" may be extended to other objects such as the cigar which a man in the picture is smoking. In one rumor, it is said to be falling (like the flower pot), though in reality it is quite securely held between his teeth.

Sometimes sharpening is achieved by ascribing movement to objects which are really stationary. Thus, a subway train, clearly at a standstill at a subway station, is frequently described as moving.

Relative size is also a primary determinant of attention. Objects that are prominent because of their size tend to be retained and sharpened. The first reporter calls attention to their prominence and each successive listener receives an impression of their largeness. He then proceeds to sharpen this impression in his memory. The large Negro may, in the telling, become "four Negroes," or may become "a gigantic statue of a Negro."

There are verbal as well as physical determinants of attention. Thus, there is a pronounced tendency for *labels* to persist, especially if they serve to set the stage for the story. One picture is usually introduced by some version of the statement, "This is a battle scene," and this label persists throughout the series of reproductions. Another

story usually opens with the statement, "This is a picture of a race riot."

To explain this type of sharpening, we may invoke the desire of the subject to achieve some spatial and temporal schema for the story to come. Such orientation is essential in ordinary life and appears to constitute a strong need even when imaginal material is dealt with.

An additional factor making for preferential retention of spatial and temporal labels is the *primacy* effect. An item that comes first in a series is likely to be better remembered than subsequent items. Usually, the "label" indicating place and time comes at the beginning of a report and thus benefits by the primacy effect.

Sharpening also occurs in relation to familiar symbols. In one series of reports, a church and a cross are among the most frequently reported items, although they are relatively minor details in the original picture. These well known symbols "pack" meaning and are familiar to all. The subject feels secure in reporting them because they have an accustomed concreteness that the other details in the picture lack. Retention of familiar symbols advances the process of conventionalization that is so prominent an aspect of rumor-embedding. In two of our pictures are a night stick, symbol of police authority, and a razor, stereotyped symbol of Negro violence. These symbols are always retained and sharpened.

Explanations added by the reporter to the description transmitted to him comprise a final form of sharpening. They represent a tendency to put "closure" upon a story which is felt to be otherwise incomplete. They illustrate the "effort after meaning" which customarily haunts the subject who finds himself in an unstructured situation. Such need for sharpening by explanation becomes especially strong when the story has been badly distorted and the report contains implausible and incompatible items. As an example, one subject who received a badly confused description of the subway scene FIGURE 1 inferred that there must have been "an accident." This explanation seemed plausible enough to successive listeners and so was not only accepted by them but sharpened in the telling.

In everyday rumors, sharpening through the introduction of specious explanations, is very apparent. Indeed, as we have said, one of the principal functions of a rumor is to explain personal tensions. To accept tales of army waste or special privilege among OPA officials

could "explain" food shortages and discomfort. Such stories, therefore, find wide credence.

Here, perhaps, is the place to take issue with the popular notion that rumors tend to expand like snowballs, become over-elaborate, and verbose. Actually, the course of rumor is toward brevity, whether in the laboratory or in everyday life. Such exaggeration as exists is nearly always a sharpening of some feature resident in the original stimulus-situation. The distortion caused by sharpening is, of course, enormous in extent; but we do not find that we need the category of "elaboration" to account for the changes we observe.

Assimilation

It is apparent that both leveling and sharpening are selective processes. But what is it that leads to the obliteration of some details and the pointing-up of others; and what accounts for all transpositions, importations, and other falsifications that mark the course of rumor? The answer is to be found in the process of *assimilation*, which has to do with the powerful attractive force exerted upon rumor by habits, interests, and sentiments existing in the listener's mind.

Assimilation to Principal Theme. It generally happens that items become sharpened or leveled to fit the leading motif of the story, and they become consistent with this motif in such a way as to make the resulting story more coherent, plausible, and well rounded. Thus, in Protocol A, the war theme is preserved and emphasized in all reports. In some experiments using the same picture, a chaplain is introduced, or people (in the plural) are reported as being killed; the ambulance becomes a Red Cross station; demolished buildings are multiplied in the telling; the extent of devastation is exaggerated. All these reports, false though they are, fit the principal theme—a battle incident. If the reported details were actually present in the picture, they would make a "better" *Gestalt*. Objects wholly extraneous to the theme are never introduced—no apple pies, no ballet dancers, no baseball players.

Besides importations, we find other falsifications in the interest of supporting the principal theme. The original picture shows that the Red Cross truck is loaded with explosives, but it is ordinarily reported as carrying medical supplies which is, of course, the way it "ought" to be.

The Negro in this same picture is nearly always described as a

soldier, although his clothes might indicate that he is a civilian partisan. It is a "better" configuration to have a soldier in action on the battlefield than to have a civilian among regular soldiers.

Good Continuation. Other falsifications result from the attempt to complete incompleted pictures or to fill in gaps which exist in the stimulus field. The effort is again to make the resulting whole coherent, and meaningful. Thus, the sign, "Loew's Pa . . .," over a moving picture theater is invariably read and reproduced as "Loew's Palace" and Gene *Antry* becomes Gene *Autry*. "Lucky Rakes" are reported as "Lucky Strikes."

All these, and many instances like them, are examples of what has been called, in *Gestalt* terms, "closures." Falsifications of perception and memory they are, but they occur in the interests of bringing about a more coherent, consistent mental configuration. Every detail is assimilated to the principal theme, and "good continuation" is sought, in order to round out meaning where it is lacking or incomplete.

Assimilation by Condensation. It sometimes seems as though memory tries to burden itself as little as possible. For instance, instead of remembering two items, it is more economical to fuse them into one. Instead of a series of subway cards, each of which has its own identity, reports sometimes refer only to "a billboard," or perhaps to a "lot of advertising" (figure 1). In another picture, it is more convenient to refer to "all kinds of fruit," rather than to enumerate all the different items on the vendor's cart. Again, the occupants of the car come to be described by some such summary phrase as" several people sitting and standing in the car." Their individuality is lost.

Assimilation to Expectation. Just as details are changed or imported to bear out the simplified theme that the listener has in mind, so too many items take a form that supports the agent's habits of thought. Things are perceived and remembered the way they *usually* are. Thus, a drugstore in one stimulus-picture, is situated in the middle of a block; but, in the telling, it moves up to the corner of the two streets and becomes the familiar "corner drugstore." A Red Cross ambulance is said to carry medical supplies rather than explosives, because it "ought" to be carrying medical supplies. The kilometers on the signposts are changed into miles, since Americans are accustomed to having distances indicated in miles.

The most spectacular of all our assimilative distortions is the find-

ing that, in more than half of our experiments, a razor moves (in the telling) from a white man's hand to a Negro's hand (FIGURE 1). This result is a clear instance of assimilation to stereotyped expectancy. Black men are "supposed" to carry razors, white men not.

ASSIMILATION TO LINGUISTIC HABITS. Expectancy is often merely a matter of fitting perceived and remembered material to pre-existing verbal clichés. An odd example is found in the case of a clock tower on a chapel. In the telling, the chapel becomes a "chaplain" and the clock, having no place to go, lands on a fictitious mantelpiece.

> *Sixth Reproduction:* This is a picture of a battlefield. There is a chapel with a clock which says ten minutes to two. A sign down below gives the direction to Paris and Paris is 50 miles, and Cherbourg 21 miles away. People are being killed on the battlefield.
>
> *Seventh Reproduction:* This is a picture of a battlefield. There is a chaplain, and a clock on the mantelpiece says ten minutes to two. There is a sign, so many miles to Cherbourg.

The powerful effect that words have in arousing images in the listener and fixing for him the categories in which he must think of the event is, of course, a major step in the conventionalization of rumor. A "zoot-suit sharpie" arouses a much more compelling image (capable of assimilating all details to itself) than more objective words, such as "a colored man with pegged trousers, wide brimmed hat, etc." (FIGURE 1). Rumors are commonly told in terms of verbal stereotypes. Over and over again, they include prejudicial judgment, such as "draft dodger," "Japanese spy," "brass-hat," "dumb Swede," "long-haired professor," and the like.

MORE HIGHLY MOTIVATED ASSIMILATION

Although the conditions of our experiment do not give full play to emotional tendencies underlying gossip, rumor, and scandal, such tendencies are so insistent that they express themselves even under laboratory conditions.

ASSIMILATION TO INTEREST. It sometimes happens that a picture containing women's dresses, as a trifling detail in the original scene, becomes, in the telling, a story exclusively about dresses. This sharpening occurs when the rumor is told by groups of women, but never when told by men.

A picture involving police was employed with a group of police officers as subjects. In the resulting protocol, which follows, the entire reproduction centers around the police officer (with whom the subjects undoubtedly felt keen sympathy or "identification"). Furthermore, the nightstick, a symbol of his power, is greatly sharpened and becomes the main object of the controversy. The tale as a whole is protective of, and partial to the policeman.

Protocol B

Description from the screen: This is an excerpt from a motion picture that appeared in a national magazine. The scene is Detroit during the colored-white riot. There is a crowd around a police officer with a riot stick in his right hand and a Negro sitting on the ground, holding to his leg. On the right a boy is running away. On the left, facing the officer is a man who looks hostile but is afraid to go nearer because of the riot stick. The crowd comprises approximately 100 people.

First Reproduction: The picture on the screen is an excerpt from a motion picture taken at the time of the Detroit riot. In the picture, a police officer with a stick in his right hand is standing over a man on the ground. On the right, is a small boy; on the left, is a man who wants to interfere but is afraid of the policeman's stick.

Second Reproduction: This is an excerpt from a movie taken at the time of the Detroit riot. There is an officer with a stick in his hand and a man on the ground. There is a small boy and a man who wants to interfere but is afraid.

Third Reproduction: Picture was taken during the Detroit riot. There is a man in the picture, also a police officer. The man has a stick in his hand and wants to interfere, but does not for some reason. There is also a child.

Fourth Reproduction: This is a picture of the Detroit riot showing a policeman and a civilian. The policeman has a billy in his hand and the man wants to take it away from him.

Fifth Reproduction: A picture of the Detroit riot. There is a police officer with a club. Somebody wants to take it away from him.

Protocols based on the same picture, taken from a group of subjects who were not policemen, show how, in a different group, the focus of interest and direction of sympathy may be quite different. Only the police tell rumors that favor the police.

Assimilation to Prejudice. Hard as it is in an experimental situation to obtain distortions that arise from hatred, yet we have in our material a certain opportunity to trace the hostile complex of racial attitudes.

We have spoken of the picture which contained a white man holding a razor while arguing with a Negro. In over half of the experiments with this picture, the final report indicated that the Negro (instead of the white man) held the razor in his hand, and several times

he was reported as "brandishing it wildly" or as "threatening" the white man with it (FIGURE 1).

Whether this ominous distortion reflects hatred and fear of Negroes we cannot definitely say. In some cases, these deeper emotions may be the assimilative factor at work. And yet the distortion may occur even in subjects who have no anti-Negro bias. It is an unthinking cultural stereotype that the Negro is hot-tempered and addicted to the use of razors as weapons. The rumor, though mischievous, may reflect chiefly an assimilation of the story to verbal-clichés and conventional expectation. Distortion in this case may not mean assimilation to hostility. Much so-called prejudice is, of course, a mere matter of conforming to current folkways by accepting prevalent beliefs about an out-group.

Whether or not this razor-shift reflects deep hatred and fear on the part of white subjects, it is certain that the reports of our Negro subjects betray a motivated type of distortion. Because it was to their interest as members of the race to de-emphasize the racial caricature, Negro subjects almost invariably avoided mention of color. One of them hearing a rumor containing the phrase, "a Negro zoot-suiter," reported "There is a man wearing a zoot suit, *possibly* a Negro."

For one picture, a Negro reporter said that the colored man in the center of the picture "is being maltreated." Though this interpretation may be correct, it is likewise possible that he is a rioter about to be arrested by the police officer. White and Negro subjects are very likely to perceive, remember, and interpret this particular situation in quite opposite ways.

Thus, even under laboratory conditions, we find assimilation in terms of deep-lying emotional predispositions. Our rumors, like those of everyday life, tend to fit into, and support, the occupational interests, class or racial memberships, or personal prejudices of the reporter.

CHILDREN

Our findings showed a striking lack of interest among children in the racial identity of characters in the picture. A "Negro" was often reported simply as a "man." In the case of pictures disclosing racial identity, 85 per cent of our adult protocols mentioned this identity, while only 43 per cent of protocols taken from children did so.

Though we do not have extensive data from different age levels, it

appears certain that the younger the child, the less he is likely to report ethnic character. One is reminded of the case of Tommy, aged six, who asked his mother if he might bring his schoolmate Sam home to lunch next day. Knowing that Tommy was in a "mixed" school, his mother asked if Sam was a Negro. Tommy replied, "I didn't notice, but I'll look and tell you tomorrow."

Our experiment offers an opportunity to study the growing importance of ethnic identity in word of mouth stories told by children of successive ages.

Conclusion: The Embedding Process

Leveling, sharpening, and assimilation, are not independent mechanisms. They function simultaneously, and reflect a singular subjectifying process that results in the autism and falsification which are so characteristic of rumor. If we were to attempt to summarize what happens in a few words we might say:

Whenever a stimulus field is of potential importance to an individual, but at the same time unclear, or susceptible of divergent interpretations, a subjective structuring process is started. Although the process is complex (involving, as it does, leveling, sharpening, and assimilation), its essential nature can be characterized as an effort to reduce the stimulus to a simple and meaningful structure that has adaptive significance for the individual in terms of his own interests and experience. The process begins at the moment the ambiguous situation is perceived, but the effects are greatest if memory intervenes. The longer the time that elapses after the stimulus is perceived the greater the threefold change is likely to be. Also, the more people involved in a serial report, the greater the change is likely to be, until the rumor has reached an aphoristic brevity, and is repeated by rote.

Now, this three-pronged process turns out to be characteristic not only of rumor but of the individual memory function as well. It has been uncovered and described in the experiments on individual retention conducted by Wulf, Gibson, Allport,[6] and, in Bartlett's memory experiments carried out both on individuals and on groups.[7]

Up to now, however, there has been no agreement on precisely the terminology to use, nor upon the adequacy of the three functions we

[6] Conveniently summarized in **K. Koffka** Principles of Gestalt Psychology. Harcourt Brace & Co. New York. 1935.
[7] **F. C. Bartlett** Remembering. Cambridge University Press. 1932.

here describe. We believe that our conceptualization of the three-fold course of change and decay is sufficient to account, not only for our own experimental findings and for the experiments of others in this area, but also for the distortions that everyday rumors undergo.

For lack of a better designation, we speak of the three-fold change as the *embedding* process. What seems to occur in all our experiments and in all related studies is that each subject finds the outer stimulus-world far too hard to grasp and retain in its objective character. For his own personal uses, it must be recast to fit not only his span of comprehension and his span of retention, but, likewise, his own personal needs and interests. What was outer becomes inner; what was objective becomes subjective. In telling a rumor, the kernel of objective information that he received has become so embedded into his own dynamic mental life that the product is chiefly one of projection. Into the rumor, he projects the deficiencies of his retentive processes, as well as his own effort to engender meaning upon an ambiguous field, and the product reveals much of his own emotional needs, including his anxieties, hates, and wishes. When several rumor-agents have been involved in this embedding process, the net result of the serial reproduction reflects the lowest common denominator of cultural interest, of memory span, and of group sentiment and prejudice.

One may ask whether a rumor must always be false. We answer that, in virtually every case, the embedding process is so extensive that no credibility whatever should be ascribed to the product. If a report does turn out to be trustworthy, we usually find that secure standards of evidence have somehow been present to which successive agents could refer for purposes of validation. Perhaps the morning newspaper or the radio have held the rumor under control, but when such secure standards of verification are available, it is questionable whether we should speak of rumor at all.

There are, of course, border-line cases where we may not be able to say whether a given tidbit should or should not be called a rumor. But if we define rumor (and we herewith propose that we should), as *a proposition for belief of topical reference, without secure standards of evidence being present*—then it follows from the facts we have presented that rumor will suffer such serious distortion through the embedding process, that *it is never under any circumstances a valid guide for belief or conduct.*

SECTION OF ANTHROPOLOGY

NOVEMBER 26, 1945

DOCTOR FRANCIS L. K. HSU, Formerly Professor of Social Anthropology, National Yunnan University, Kunming, China; Lecturer of Anthropology, Columbia University, New York: *The Problem of Education in Contemporary China.*

EDUCATION, A PROBLEM OF CULTURAL TRANSITION

In any society, the problem of education is one of transmitting a large or small part of its culture from one generation to another. The amount and variety transmitted are usually regarded as necessary for the younger generation to exist and function as fully as possible in the society.

There are two broad classes of problems involved. Where the society is not in a state of rapid change, the process of transmission is made comparatively easy. In such a configuration, family, school and the wider society more or less work together. The individual is likely to be able to pass from one stage to another without significant trouble; and the society is likely to be able to absorb products of the schools.

Where the society is in a state of rapid change, the process of transmission is much more complicated. Here, the problem involves not only cultural transition from the older to the younger generation; but also a change from old to new standards for all, as well as the ability of the society to assimilate the products under new standards. Here, the problem of education concerns not only rules of social behavior and methods of using tools, but also mores connected with the use of such tools.

Education in contemporary China is a problem which belongs to the latter category. It is a situation in which family, school and the society fail, at least temporarily, to conform to each other's standards. standards.

EDUCATION IN TRADITIONAL CHINA

In order to understand education in contemporary China, it is

necessary to grasp its basic features in traditional China. By traditional China is meant here China before 1842, when Chinese society was free from significant western influences and was more or less a self-contained whole. In that China, informal education had three objects. The first object was education for livelihood. This kind of education was mainly divided according to sex, one of the cardinal principles of the kinship structure. In this case, the male was taught to carry on one type of activities and the female, a different kind. Sons followed their fathers, while daughters took after their mothers. Sometimes, there was overlapping. Nevertheless, the two centers of activity were unmistakable.

The second object was education for social adequacy. This was again based upon two main principles of paramount importance in the kinship structure. The first principle was the supremacy of the authority of the parents, especially that of the father. The second was the suppression of the expression of sex. The latter called not only for the suppression of the expression of sex in the narrower sense, such as that which is related to lovemaking or sexual intercourse, but also for the suppression of any expression of affection between man and wife.

Under this education, the socially adequate person was he who was exceedingly filial to his parents, who maintained harmonious relations with his brothers and relatives, and who minimize, to the best of his ability, his feelings for members of his individual family circle, that is, his wife and unmarried children. He never tried to improve things in any channels, except those paternally sanctioned. The younger generation was taught after the pattern of the older.

The third object in the older education was ritual adequacy. Ritual adequacy was really supplementary to social adequacy. The world of spirits was a close copy of the world of humans. In that world, there were at least two main groups of spirits and a vast number of higher gods. In one group, were the dead members of the family, the dead relatives and dead friends. In a second group were the spirits of those who were not related friends. Spirits of family members, relatives and friends were always friends toward the particular family to which they belonged, as well as to their living friends and relatives. But the spirits who did not belong to this category were of uncertain disposition. They might be friendly if they were pleased, or they

might be harmful when they were antagonized, or they might be indifferent. The individual must either please them positively, or, by remaining negative, at least, not offend them. The higher gods upheld all the qualities encouraged in social adequacy and would punish significant culprits who sinned against the same qualities.

In traditional China, formal education was a part of informal education. By formal education, is meant institutionalized education, such as that given in schools and universities.

In such an education, a livelihood was to be made by studying the classics and working to pass a number of successive examinations. Successful candidates would enjoy opportunities of becoming members of the official hierarchy. In traditional China, there was no significant industry other than agriculture. Officialdom, which absorbed the more energetic elements of the society, was practically an industry under the circumstances.

In relation to social adequacy, formal education merely emphasized the rules upheld by informal education, but it went further.

The qualities encouraged in both types of education were similar, but a learned person was expected to show greater adherence to classical rules in matters of filial piety, sex behavior, etc.

Theoretically, Chinese scholars were not supposed to take too much notice of the spiritual world. Confucius was known for his attitude of indifference toward the world of spirits. Nevertheless, as most ritual matters were communal matters, and all scholars were taught to be harmonious with the communities in which they lived and participated, as members, this theoretical indifference was of no material consequence.

In traditional China, formal education was under the close supervision of the family. When a person had reached the top, through formal education, he would come back to the family, through the belief that an individual owed all to his ancestors.

Transitional China

By transitional China, is meant China since 1842, and especially after 1911, when she became a republic, and when all traditional institutions of education and examination were formally abolished. It was in the latter period, that adherence to Western influences became,

no longer, a crime to be punished. As a matter of fact, Western influences had definitely become more fashionable.

Informal education remained, however, the same as before, for the vast majority of the Chinese. As a result, formal education, as given in schools, and informal education, as given in homes and neighborhoods, were often conflicting propositions. For school education was greatly changed in scope, method, and results. The first thing to be mentioned was the abolition of the old imperial examination system. The second was the fact that the new schools taught new subjects and were no longer under the control of the family. More schools were established through government, missionary and commercial efforts. Also, schools became more expensive. The third important point was the fact that the literati as a group lost some of their old prestige. Formerly, a scholar who had passed the elementary examination was entitled to certain privileges in any community. Now, a primary school graduate, or even a middle school graduate, not in command of any post, does not enjoy nearly the same prestige, as formerly, in the eyes of the illiterate public. The fourth factor is the series of social conflicts that resulted. These conflicts are many and varied but they may be reduced to four general categories.

One category of social conflict appears in connection with sanitation and health. School children are taught not to spit on the floor, to take baths regularly, to have injections when there is a cholera epidemic, etc. When they go home, however, they find the barrier of age-old habits, deeply entrenched in the minds of their parents and senior relatives, practically insurmountable.

The second category of social conflict concerns sex. This conflict expresses itself in two ways. It involves the question of sex mores. Some traditional ideas stipulated that women were unclean, especially those in their monthly periods or after childbirth. Other traditional ideas prescribed that men and women should not meet freely and become friends. Some missionary schools have tried their best to meet the second of these traditional requirements by censoring letters of their students and expelling boys and girls who were found guilty of having communicated privately with each other. But, on the whole, the norm of behavior taught in the new schools departs further and further from that which has been upheld for centuries. The second difficulty concerns the choice of a life partner. There have been many tragedies in

which a man's educational level and that of his wife were vastly different. They were married by parental authority when they were young. Later on, the man went to school and college while his wife stayed behind. There are many instances in which the man, in such a situation, worked very hard and succeeded in raising the educational level of his ignorant wife, but there are other instances in which no happy solution could be found.

A third category of social conflict concerns family bonds. Parental authority is being broken more and more by a greater expression of exclusive intimacy between man and wife. Needless to say, many parents find this experience very bitter. Another point in this category is that, according to the traditional code, a man who is in a position of influence should help all his relatives by giving them jobs and other assistance, without seriously considering their suitability for the jobs, or the assistance which they require. Nowadays, many younger and idealistic people have a hard time in struggling against this age-old harness.

The fourth category of social conflict may be called unemployment among the educated. Unemployment among the *literati* has always been a fact in traditional China. Everybody knows about Peking and its hundreds of thousands of scholars waiting for official posts, long before 1842. But since the revolution of 1911, this unemployment has changed its character considerably, in the following ways:

Formerly, the aim of any and every scholar was clear. He had to study the classics, pass the examinations and then look for a post in the official hierarchy. There was also a general attitude of reverence among the public toward any and every scholar. There was no other place for members of the *literati* than in the official hierarchy. Those who were unsuccessful in attaining official posts could always have something to fall back on at home in their own community, where they would be supported in one way or another.

Now, the aim among the educated has become less clear. There are, no longer, imperial examinations. There is also the general, but vague idea that scholars should not look toward official hierarchy as their only salvation. There are all kinds of ideas concerning social and economic improvement of the country as a whole. As the result of contact with the West, a wide variety of acute needs has arisen. Some of these have existed before but never have been so clearly felt and defined,

until now. But the new members of the *literati* are often not equal to most of the tasks. Some of the difficulties involved are the following: (1) The new techniques of social and economic improvement, which are taught in the school, cannot be applied very easily to a vast country with a long and ancient tradition. Among Chinese literati, there has never been any tradition or experience in organization for active purposes. Non-official organizations, even on a vast scale, have always existed in the country, but they were organized along established lines for purposes of maintaining the *status quo*. Few of them were organized for purposes of actively promoting ends which were not defined by tradition and which, in many ways, would have to contend with the huge, opposing forces of custom and inertia. Yet, the application of most of the newly acquired techniques in such fields as agriculture, cooperatives, and industries requires no less than modern types of organization.

The second difficulty is the matter of class distinction. From a vertical point of view, neither traditional China nor contemporary China has any class structure. That is to say, an individual who is able to rise above his station of birth by ability or other means is not handicapped because of his lower origin. On the other hand, at any given point of time, there was and is a clear class structure. In this, the most fundamental division has always been between manual workers, on the one hand, and literary workers, on the other. Many educated persons in the new situation are, therefore, finding themselves unable to take advantage of some of the newer opportunities, because they involve a certain loss of the *literati* status.

The third difficulty involved is the vast difference in standards of living between the educated class, on the one hand, and the majority of the population, on the other. Before the present Sino-Japanese war, the average salary of a university graduate, if he secured a job, would be about eight to ten times the salary of a waiter in a restaurant or of a shop assistant. The implication of this is perfectly clear. The vast majority of the industrial and commercial establishments had needs but were unable to offer rewards which would be equal to the standard of living of the educated.

The fourth difficulty is closely related to the third and is, of course, a most fundamental one. That is the lack of industrial development in China, as a whole. We may say that China is overpopulated, or we

may say that she is suffering from under-production. These are two ways of saying the same thing. Without fairly extensive industrial development, it was impossible to absorb the considerable number of men and women turned out by the new institutions of education. That was why needs in the vast majority of the traditional workshops and salesrooms and unemployment among the educated existed at the same time.

Without considering these fundamental points, some enthusiastic reformers have started the so-called college-student-go-back-to-village movement. These people and others exhorted products of modern education to go back to their rural districts with the intention of improving the life and conditions of millions of farmers while, at the same time, they would have to live, more or less, under the same conditions that they were trying to improve. This movement has two drawbacks: The first is that, without some sort of religious or other type of fanaticism, it has never been possible, throughout the known years of history of mankind, to get people, who are used to a higher level of comfort and have been taught the necessity of such comfort, voluntarily to give these up in favor of a life which is literally a fraction of their customary standard. The second drawback is more fundamental. These reformers have failed to recognize that reformation of rural conditions must be sustained by improvement of urban production, for the disastrous conditions of many Chinese villages are the result of forces beyond the control of the local communities and their inhabitants.

Prospect

There is no single answer to the problem of education in contemporary China. It is dependent upon a number of factors. There are two ultimate goals. First, universal literacy, or at least, literacy for the majority. Literacy, as such, is no guarantee for the attainment of democracy. But without a high degree of literacy, democracy on a large scale is impossible. With a higher degree of literacy will come a higher degree of separation of social considerations from technical matters. The sharp distinction, in terms of prestige and salaries, between manual and brain workers will be reduced. Technical requirements among the educated will be diversified. Literacy, as such, would no longer be a distinction by itself, because everybody will be literate or nearly so.

Secondly, a high degree of cooperation and coordination between

the three angles of the problem: home, school and society. A number of writers on modern Chinese education have emphasized the necessity of developing a kind of education which will be in keeping with the social conditions. The complaint is against many things which have been pointed out in the body of this paper, such as, for example, the fact that many graduates of schools and colleges who could not find employment or otherwise be absorbed by the society. There is nothing wrong with such complaints. What many writers have failed to realize is the fact that during the period of active social transformation, a good deal of dislocation in the home, school and the wider society is natural. In this configuration, the home usually represents the most conservative force. The school represents the more radical force, which has as its aim systematic introduction of new thoughts, behavior and technique into the society. Whereas, the wider society usually presents an uneven picture with some sections of it more conservative than others. It is essential to realize that unless we want the entire society to go back completely to its traditional form, we must emphasize the importance of the schools as the most important agency in this social transformation, and that it is the goal not to bend the institutionalized education to suit the conservative and backward conditions of the society, but to improve the latter and raise it gradually to the standard of the former.

Therefore, it will be well for thinkers on Chinese education to remember that the problem of education is first and foremost bound up with her economic developments. Industrialization, on a wide scale, is a legitimate aim, as ultimately essential to the solution of the problem of education in contemporary China. Industrialization will provide the resources for universal education. It will provide the contacts and opportunities among the population which will foster a desire for higher standards of living and this is an incentive to acquire more and better education. Until the people actively wish education on their own initiative, education on a large scale will never be realized. On the other hand, unless, through industrialization, the economic and other advantages are brought home to the parents and relatives, the people are not likely to want this education on their own. In other words, the home culture and the informal education it provides for the individual must be sufficiently in line with the aims and methods of

the school or formal education. And the success of both are again closely bound up with the wider economic development.

In this paper, I have merely analyzed and outlined some of the complex factors involved in the problem of education in contemporary China. The one significant factor I have not touched upon is the political framework which obviously will condition the whole configuration. The end result of a political framework which is molded upon giving the people greater freedom, equality of opportunities, and an increasing share in their own government will be diametrically opposed to that of a political framework which is determined to deprive the people of their freedom and equality of opportunities and any share in their own government.

NEW MEMBERS

Elected November 29, 1945

SUSTAINING MEMBERSHIP

Atkin, Lawrence, Ph.D., Biochemistry, Nutrition. Head, Nutrition Research, Fleischmann Laboratory, New York, N. Y.

ACTIVE MEMBERSHIP

Abt, Lawrence Edwin, Ph.D., Psychology and Anthropology. Senior Psychologist, U. S. Naval Hospital, St. Albans, N. Y.

Bernstein, Seymour, Ph.D., Organic Chemistry. Research Chemist, Lederle Laboratories, Inc., Pearl River, N. Y.

Bevelander, Gerrit, Ph.D., Biology. Associate Professor of Anatomy, New York University, New York, N. Y.

Boccalatte, Beatrice, Bacteriologist and Student, College of New Rochelle, New Rochelle, N. Y.

Brodie, Bernard B., Ph.D., Biochemistry, Pharmacology. Assistant Professor of Pharmacology, New York University Medical College, New York, N. Y.

Connor, Thomas W., B.S., Biology and Public Health. Technical Writer and Editor, New York, N. Y.

Ferry, Clayton W., Ph.D., Organic Chemistry. Chief, Chemical Development Laboratory, Burroughs-Wellcome Company, Inc., Tuckahoe, N. Y.

Friedman, Harris Leonard, Ph.D., Organic Chemistry. Director, Division of Pure Research, Pyridium Corporation, Yonkers, N. Y.

Gilder, Helena, M.D., Biochemistry. Visiting Investigator, Rockefeller Institute for Medical Research, New York, N. Y.

Hough, Jack L., Ph.D., Research Geologist, Standard Oil Development Company, New York, N. Y.

Kapit, Milton E., Ph.D., Psychologist (Private Practice), Associated with Children's Aid Society, New York, N. Y.

King, Charles Glen, Ph.D., Chemistry, Nutrition. Scientific Director, Nutrition Foundation, Inc., New York, N. Y.

Kopac, M. J., Ph.D., Chemotherapy and Cellular Mechanisms. Assistant Professor of Biology, New York University, New York, N. Y.

Lampen, J. Oliver, Ph.D., Bacterial Metabolism and Chemotherapy. Biochemist, Chemotherapy Division, American Cyanamid Company, Stamford, Conn.

Maravento, Louis W., M.D., Experimental Medicine and Surgery. Attending Surgeon, St. Joseph's Hospital, Yonkers, N. Y.; Pathologist, City of Yonkers.

Millman, Nathan, M.Sc., Biochemistry. Division of Biochemistry, Ortho Research Foundation, Linden, N. J.

Miner, Robert Bodley, B.A., Cellulose Fibers, Paper Manufacture. Vice-President, Canfield Paper Company, New York, N. Y.

Muntwyler, Edward, Ph.D., Electrolyte and Water Equilibria, Protein Metabolism. Professor of Biochemistry, Long Island College of Medicine, Brooklyn, N. Y.

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